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Effect of different organics on powdery mildew of pea (*Erysiphe pisi*)

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Abstract
The present study "Effect of organic on powdery mildew of pea (*Erysiphe pisi*)" was carried out during March, 2021-22 to study organic management against powdery mildew of pea. The incidence of powdery mildew in different blocks of Ranchi ranged between 10 to 70 percentages, whereas the average DI% of the district was around 29.2%. In block wise, DI% was highest in Tamar (38%) followed by Ormanjhi (34%), Angara (32%), Nagri (24%) and Kanke (18%). Microscopic observation revealed that the mycelium were entophytic hyaline septate. The bio- efficiency of four treatments T1 (Butter milk 10%), T2 (Turmeric extract 10%), T3 (Garlic extract 10%), T4 (Chirata leaf extract 10%) and T5 as a control against powdery mildew of pea was evaluated during-2022. The result indicated that the percent disease incidence was low (6.25%) and significantly superior over all the treatments, when the T3 (Garlic extract 10%) used as spray at weekly interval after 43 days of sowing followed by T2 (Turmeric extract 10%) 22.5 percent, T1 (Butter milk 10%) 27.5 percent and T4 (Chirata leaf extract 10%) 50 percent. After 48 hours of spray, microscopic observation of powdery mildew revealed that botanical (Garlic extract) showing better result compare to other organic.

Keywords: Powdery mildew, pea disease incidence (D.I. %), organics, erysiphe pisi, garlic extract, conidia, pathogen

1. Introduction
Pea is a one of important leguminous crop grown during cool season thought the world. In India, it is grown as winter vegetable in the plains of North India and as summer vegetable in the hills. It belongs to the family *Leguminosae* and sub-family *Papilionaceae*. At the global level, garden pea covers an area of about 2.58 million hectares with a production of 19.87 million tones and productivity of 7.67 tons per hectare (Anonymous 2016) [1]. In India total pea growing area is 0.82 million hectares with the production 0.99 million tones. Major growing states are Uttar Pradesh, Assam, west Bengal, Madhya Pradesh, and Maharashtra. India is the lager producer and consumer of pulses for accounting around 33 percent of the world total area and around 22 percent of output in India (Department of agriculture and corporation, New Delhi, 2018), (Yadav, 2020) [4].

Crop affected by large number of diseases, such as powdery mildew (*Erysiphr pisi*), Ascochyta blight (*Ascochyta spp*.), bacterial blight (*Pseudomonas syringae* pv *erysiphe*), and pea rust (*Uromyces pisi*). Powdery mildew disease caused by obligate parasitic pathogen. In the areas having semi arid climate, the disease attains a serious status causing large losses in the pod quality and total yield (Rathi and Tripathi, 1994) reported more than 50% yield losses in severely infected fields. In high rainfall areas the disease is of less important. This disease usually appear late in the season, reaching maximum intensity during the pod formation stage, resulting in varying degrees of yield loss. The pathogen causes up to 50% losses and reduces pod quality (Dixon, 1978) [2].

Powdery mildew remains a serious problem in all the rice-based cropping systems of Chhattisgarh, Andhra Pradesh, Madhya Pradesh, Orissa and Jharkhand. Use of chemicals for the management of powdery mildew affects not only plant but also misbalance whole ecosystem and it was observed that the chemical control is not always completely effective since pathogens may develop resistance races to some fungicides (Gullino and Wardlow, 1999) [5]. Plant extract can also be used as alternative for the management of plant diseases, because of indiscriminate use of synthetic fungicides causes serious threat to human health. Plant extract like ginger extract both store at fresh and stored at different concentration (10000, 15000, 20000 ppm) and found the highest dose of extract to be the best to control powdery mildew of pea as compared to the store ones.

The present study was carried out to study effects of different organics on powdery mildew of pea (*Erysiphe pisi*) and study the disease incidence of powdery mildew of pea in Jharkhand.

2. Materials and Methods

An intensive survey was conducted during 2021-2022 to record the disease incidence of powdery mildew of Pea in growing area of Ranchi. The symptoms of powdery mildew of Pea were carefully observed. In field observed that pea plant showing characteristics symptoms of powdery mildew. The data were taken from different 5 blocks and from each block 5 villages has been selected from Ranchi district of Jharkhand these were as follows Angara (Villages-Nagrabera, Kari duda, Barva Toli, Rangamati, Galelshea), Kanke (Villages-Bajra, Boreya, Gatlatu, Kamre, Sutiambe), Tamar (Villages-Khothadih, Bagaldih, Bhuradih, Bimra, Haradih), Nagri (Lada, Nagri, Piska, Daladali, Saher), Ormanjhi (Villages-Anandi, Dabu, Kulhimore, Jirabera, Baridih).

$$\text{Per cent} = \frac{\text{Number of plants affected}}{\text{Total number of plants observed}} \times 100$$

The lab experiment was conducted in Faculty of ARTD, Ramakrishna Mission Vivekananda Research and Educational Institute, Ranchi to study the microscopic observation of powdery mildew. The field experiment consisted of four treatments and an untreated/control was laid out in Randomized Block Design (RBD) replicated four times. The experimental field was divided into four blocks and each block was again divided in to five equal plots. Thus there were 20 (4 × 5) plots. The net plot size was 12.5 m x 10.5 m. The size of each unit plot was 2.5m × 1.5 m, gaps between the block was 0.5 m, while plant to plant distance was 10 cm. All the treatments were applied as foliar spray by using knapsack sprayer. Total 14 sprays were applied at 7 days interval. First spray started after 45 days of sowing and spraying every week. The sprays were conducted at evening hours.

To study the disease incidence of powdery mildew in peas, there are five treatments including control with four replications *viz Butter milk* @10% (T_1), *Turmeric extract* @ 10% (T_2), *Garlic extract*, @ 10% (T_3) *Chirata leaf extract* @ 10% (T_4), and *Control* (T_5).

The mean value for all the characters in each replication was subjected to statistical analysis as per the method of bharadwaj (2000). Data were analyzed using Genstat version 8.1. Analysis of variance (ANOVA) was carried out for the overall treatment effects and pair wise comparison between means were determined using the least significant difference (LSD) at P = 0.05.

3. Result and Discussion

In case of block wise disease incidence of powdery mildew, It is evident from the table 4.1 that the highest disease incidence (38%) of powdery mildew was observed in Tamar (38%) followed by Ormanjhi (34%), Angara (32%), Nagri (24%) and Kanke (18%). The maximum field observation recorded at Kulhimor (70%) of Ormanjhi block and then Anandi village (50%) of Ormanjhi block. The lowest disease incidence was recorded in Kothadih of Tamar block, Boreya village of Kanke block, Piska village of Nagri block and Jirabera village of Ormanjhi block. The pea crops damage substantially in Jharkhand state due to the powdery mildew disease.

In five block farmer grow mainly five verities of pea i.e. Green wood, GS 10, Tiger 1, Usha Paragati, Arkel. Among all five verities Green wood found to be susceptible to powdery mildew recorded highest disease incidence.

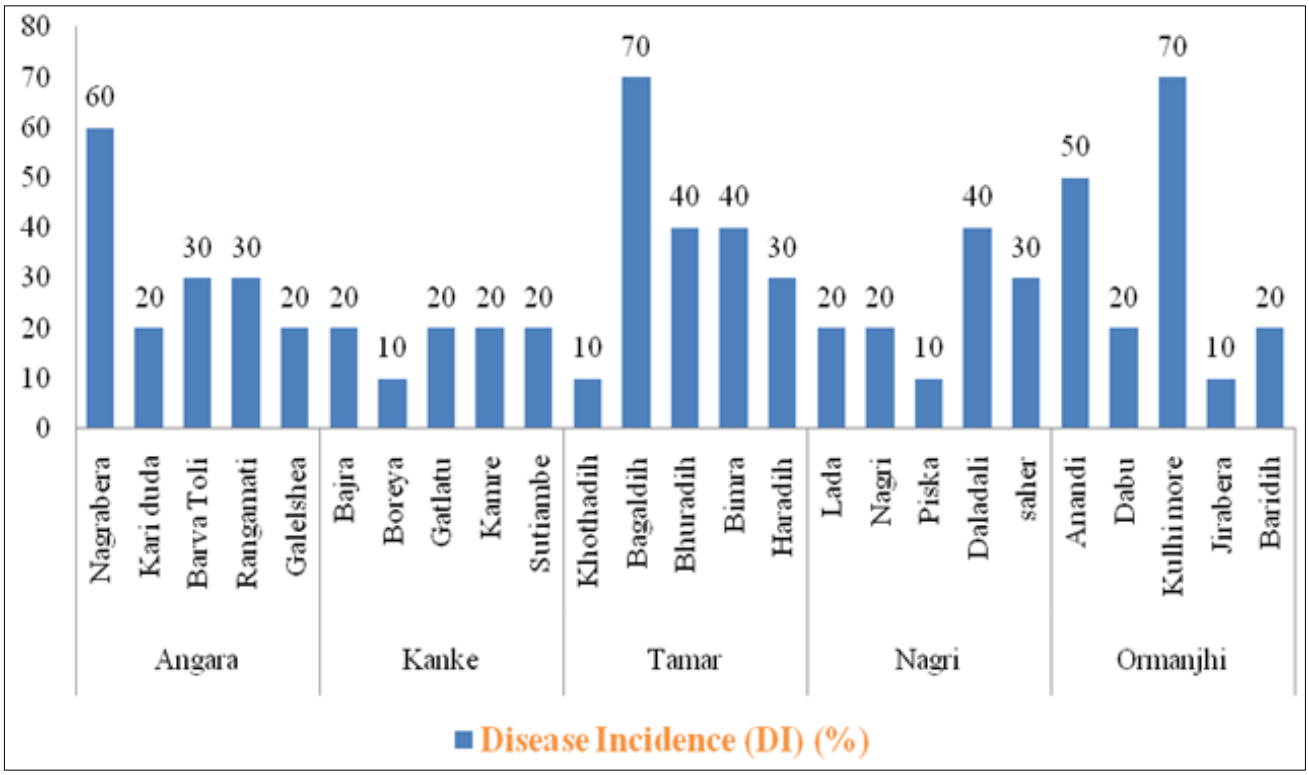
The result indicated that the percent disease incidence was low (6.25%) and significantly superior over all the treatments, when the T3 (Garlic extract 10%) used as spray at weekly interval after 45 days of sowing followed by T2 (Turmeric extract 10%) 22.5 percent, T1 (Butter milk) 27.5 percent and T4 (Chirata leaf extract) 50 percent. All the treatments were found to be significantly superior over control (55 percent) in managing the powdery mildew disease. From the ANOVA, we can suggest that the treatments are significant with T3 found to be effective for management of disease whereas T2 found the second best followed by T1. Control and T4 are at par as for the disease is concerned. In the present study four different organic (10%) where tested against powdery mildew of pea (*Erysiphe pisi*) under field condition. After 48 hours of spray, microscopic observation of powdery mildew revealed that organic (Garlic extract) showing better result compare to other organic. Organic garlic extracts collapse of conidiophores, inhibition of conidia germination, delay in fungal growth, morphological anomalies and rapid collapse of mycelium. Shape of conidia also changed from cylindrical to spherical and tip became swollen. Some of the conidia burst and release of globules structure and metabolites. Result also revealed that 10% garlic extract showed better results compare to other organic used in experiments.

Table 1: Efficacy of organics extracts against powdery mildew of peas

Sl. No.	Treatments	Disease Incidence%
1	T_3 (Garlic extract)	6.67
2	T_2 (Turmeric extract)	13.33
3	T_1 (Butter milk)	20.00
4	T_4 (Chirata leaf extract)	50.00
5	T_5 (Control)	53.33

Table 2: Incidence of powdery mildew disease in different blocks of Ranchi district during Rabi 2021

Block name	Disease Incidence (DI) (%)
Angara	32
Kanke	18
Tamar	38
Nagri	24
Ormanjhi	34
Mean value	29.2



* Showing disease incidence of powdery mildew in different block and villages of Ranchi district

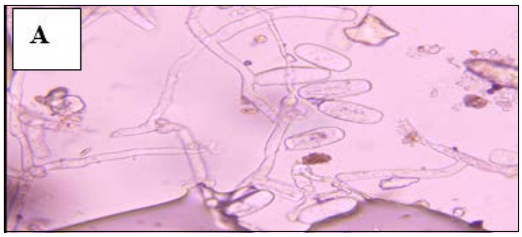


Fig A: Microscopic observations after 24 hours of garlic extract spray

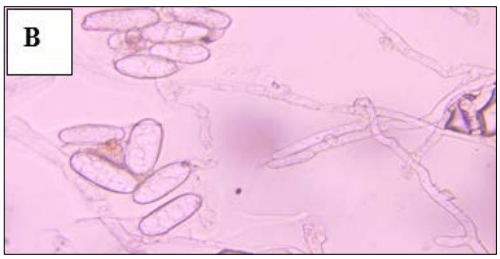


Fig B: Microscopic observations after 48 hours of garlic extract spray

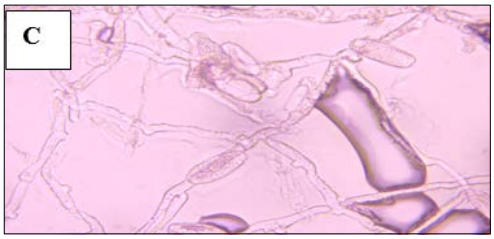


Fig C: Microscopic observations after 72 hours of garlic extract spray

4. Conclusion

Among four organics, garlic extract 10% recorded minimum disease incidence with 14 sprays at 7 days interval. Second best was turmeric.

During 2021-22 disease incidence of powdery mildew on peas was found between ranged from 10 to 70 percentages whereas the average disease incidence of overall sample of Ranchi district was around 29.2%. In case of block wise disease incidence of powdery mildew, It is evident from the table 4.1 that the highest disease incidence (38%) of powdery mildew was observed in Tamar (38%) followed by Ormanjhi (34%), Angara (32%), Nagri (24%) and Kanke (18%).

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